

**Study Guide**

For use with pages 225–229

**GOAL** Add and subtract like fractions.**EXAMPLE 1** Adding Like Fractions

You use  $\frac{3}{16}$  of a tank of gasoline to travel to your aunt's house. You use  $\frac{1}{16}$  of a tank of gasoline to travel to the store. What fraction of a tank of gasoline did you use?

$$\frac{3}{16} + \frac{1}{16} = \frac{3+1}{16}$$

Write sum of numerators over denominator.

$$= \frac{4}{16}$$

Add.

$$= \frac{1}{4}$$

Simplify.

**Answer:** You used  $\frac{1}{4}$  of a tank of gasoline.

**EXAMPLE 2** Subtracting Like Fractions

$$\text{a. } \frac{15}{19} - \frac{3}{19} = \frac{15-3}{19}$$

Write difference of numerators over denominator.

$$= \frac{12}{19}$$

Subtract.

$$\text{b. } -\frac{11}{12} - \left(-\frac{7}{12}\right) = -\frac{11}{12} + \frac{7}{12}$$

To subtract  $-\frac{7}{12}$ , add  $\frac{7}{12}$ .

$$= \frac{-11+7}{12}$$

Write sum of numerators over denominator.

$$= \frac{-4}{12}$$

Add.

$$= -\frac{1}{3}$$

Simplify.

**Exercises for Examples 1 and 2**

Find the sum or difference.

1.  $\frac{2}{7} + \frac{3}{7}$

2.  $\frac{1}{11} + \left(-\frac{6}{11}\right)$

3.  $-\frac{7}{18} + \frac{5}{18}$

4.  $\frac{5}{12} + \frac{3}{12}$

5.  $\frac{17}{19} - \frac{13}{19}$

6.  $\frac{7}{15} - \frac{2}{15}$

7.  $-\frac{11}{15} - \frac{2}{15}$

8.  $\frac{8}{15} - \left(-\frac{2}{15}\right)$

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**EXAMPLE 3 Adding and Subtracting Mixed Numbers**

$$\begin{aligned} \text{a. } 3\frac{11}{21} + 7\frac{4}{21} &= \frac{74}{21} + \frac{151}{21} \\ &= \frac{74 + 151}{21} \\ &= \frac{225}{21} \\ &= \frac{75}{7} = 10\frac{5}{7} \end{aligned}$$

Write mixed numbers as improper fractions.

Write sum of numerators over denominator.

Add.

Simplify. Then write fraction as a mixed number.

$$\begin{aligned} \text{b. } 7\frac{2}{9} - 3\frac{5}{9} &= \frac{65}{9} - \frac{32}{9} \\ &= \frac{65 - 32}{9} \\ &= \frac{33}{9} \\ &= \frac{11}{3} = 3\frac{2}{3} \end{aligned}$$

Write mixed numbers as improper fractions.

Write difference of numerators over denominator.

Subtract.

Simplify. Then write fraction as a mixed number.

**Exercises for Example 3**

Find the sum or difference.

9.  $7\frac{5}{12} + 11\frac{1}{12}$

10.  $-2\frac{7}{8} + 3\frac{3}{8}$

11.  $8\frac{7}{13} - 9\frac{10}{13}$

12.  $4\frac{8}{11} - \left(-3\frac{7}{11}\right)$

**EXAMPLE 4 Simplifying Variable Expressions**

$$\begin{aligned} \text{a. } \frac{3c}{10} + \frac{c}{10} &= \frac{3c + c}{10} \\ &= \frac{4c}{10} = \frac{2c}{5} \end{aligned}$$

Write sum of numerators over denominator.

Add. Divide out common factor. Then simplify.

$$\begin{aligned} \text{b. } \frac{11}{30x} - \frac{17}{30x} &= \frac{11 - 17}{30x} \\ &= \frac{-6}{30x} = -\frac{1}{5x} \end{aligned}$$

Write difference of numerators over denominator.

Subtract. Divide out common factor. Then simplify.

**Exercises for Example 4**

Find the sum or difference.

13.  $\frac{12x}{23} + \frac{10x}{23}$

14.  $\frac{8}{15y} + \frac{2}{15y}$

15.  $\frac{7}{12f} - \frac{5}{12f}$

16.  $-\frac{11a}{20} - \frac{8a}{20}$